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ment. From the last column of the table it appears that only seven of these pairs are under 5″ at the present time, and from the two preceding columns we find that no period of twenty-five years contains more than seven pairs under this distance. Allowing for uncertainties in the tabulation and in the measures and for the fact that BURNHAM's volume is complete only to — 30° declination, we may fairly say that *not more than ten double stars with distances at present under 5″ are known to be optical pairs.*

BURNHAM's catalogue contains 13,665 entries. Fully 5,000 of these pairs are of comparatively recent discovery and less than half of the remainder are under 5″. The data in our table may therefore be considered to be drawn from about 3,500 stars under 5″, and the conclusion, that we may expect one pair in 500 double stars under 5″ to be merely optical, is probably of the right order. I have found from my double-star survey that one star in eighteen of those as bright as 9.0 magnitude is a double with an angular separation of less than 5″. This gives a total of about 12,000 such pairs in the entire sky, and we shall not be far wrong if we say that only twenty-five of these are not physical systems. R. G. AITKEN.

March 15, 1912.

A METHOD OF TESTING OPTICAL GLASS.

It frequently happens that a large object-glass or prism, after going through the long and expensive process of grinding, polishing, and figuring, must be rejected because of internal defects in the glass. Not long ago the Solar Observatory received from a celebrated firm in Germany a large prism which was so defective that the D_1 line seen through the upper part of the prism fell upon the D_2 line observed through the lower part. The figure of the surfaces was excellent, and the whole difficulty lay within the glass. Subsequent attempts to obtain large blocks of glass for prisms have been equally unsuccessful, and as the same difficulty has been experienced with several objectives (including one of 12 inches aperture for the 150-foot tower telescope), the importance of avoiding the loss of time and the expense thus involved is apparent. It would seem probable that the following simple process of testing glass blocks or disks, without giving them a perfect optical figure, must have suggested itself to others. But perhaps it has serious defects which a trial, soon to be made here, will reveal, for I understand that all opticians now complete the figuring of objectives and prisms before they can discover inequalities of structure less obvious than those shown by the polariscope.

Suppose the block of glass to be in the form of a prism, the faces of which may be polished, but not accurately figured.[1] With the aid of a Zeiss refractometer and some fragments of the prism glass, the index of refraction is measured. The block is then placed in a tank, with two opposite windows of optical glass, the outer face of each a good optical plane, the inner one less perfect. The tank is then filled with a liquid of nearly the same index of refraction as the prism, easily prepared by mixing two liquids of higher and lower indices. Any defects of the prism glass should then be rendered visible with a Michelson interferometer, or by interposing the tank in the path of a beam of parallel light, and applying the knife-edge test. If necessary, the liquid may be kept at a constant temperature and stirred during the observations.

If the tank were stably mounted and quite free from vibration, a simple reflecting surface (perhaps even a mercury surface) as its base, returning the light sent vertically downward through the block of glass, might serve in place of the two windows. But in this case the liquid could not be stirred nor the block of glass moved during the test.

George E. Hale.

A List of Fifty Spectroscopic Binary Stars Discovered with the Sixty-Inch Reflector at Mt. Wilson.

Star	α (1910)	δ (1910)	Mag.	Type	Range	No. of Plates	
Groom. 58	0^h $19^m.4$	+51° 31′	5.6	B5	+ 5 to —35^{km}	5	
12 *Cassiopeiæ*	0 19 .8	+61 20	5.6	B9	+ 5 to —49	5	
49 *Ceti*	0 25 .9	—24 17	5.4	A2	+32 to — 3	3	
23 *Cassiopeiæ*	0 41 .7	+74 21	5.5	B9	+18 to —30	6	
1 *Persei*	1 46 .1	+54 42	5.7	B3	+77 to —19	4	
ω *Cassiopeiæ*	1 49 .0	+68 15	5.2	B9	+12 to —46	4	
62 *Andromedæ*	2 13 .5	+46 58	5.4	A	—21 to —40	3	Composite spectrum
π *Arietis*	2 44 .2	+17 5	5.5	B5	+35 to + 7	4	

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[1] A preliminary test can be made with the rough block, and in any case a polished surface is not essential, though an approximately plane figure is advantageous.

Star	α (1910)	δ (1910)	Mag.	Type	Range	No. of Plates	
Piazzi 9	3 9 .8	+30 13	5.7	A	+ 8 to −17	5	Probably comp. spectrum
30 *Persei*	3 11 .7	+43 42	5.5	B5	+23 to −14	5	
Bradley 480	3 24 .2	+47 48	6.1	B8	+24 to + 1	4	
13 *Tauri*	3 37 .1	+19 25	5.7	B8	+ 8 to −59	2	
24 *Eridani*	3 39 .9	− 1 29	5.4	B8	+75 to +41	3	
42 *Persei*	3 43 .8	+32 49	5.3	A2	+13 to −42	4	
809 Groom.	4 13 .4	+50 42	5.6	B3	+ 3 to −42	5	
88 *Tauri*	4 30 .7	+ 9 59	4.4	A2	+75 to −44	3	
Pulkova 801	5 10 .4	+34 13	6.0	B5p	+53 to +64	6	Two spectra[1]
Greenwich 412	5 28 .9	− 1 13	5.6	B2	+134 to −138	2	
1149 *Groom.*	6 18 .8	+56 20	5.7	A5	+21 to −76	3	
1056 *Bradley*	7 15 .5	+55 29	5.9	B8	+90 to −80	3	Two spectra
62 *Cancri*	8 52 .2	+15 40	5.3	A3	−13 to −46	3	
α *Cancri*	8 53 .6	+12 12	4.4	A3	−21 to −59	3	
19 *Hydræ*	9 4 .3	− 8 14	5.6	B8	+46 to + 6	4	
42 *Leo. Min.*	10 40 .9	+31 9	5.4	B9	+40 to − 9	3	
95 *Leonis*	11 51 .0	+16 9	5.7	A2	+ 7 to −90	2	
31 *Crateris*	11 56 .2	−19 9	5.4	B3	+85 to −116	4	
85 *Virginis*	13 40 .7	−15 19	6.4	B9	+11 to −93	2	
50 *Boötis*	15 18 .2	+33 15	5.6	B9	+23 to −41	3	
35 *Libræ*	15 27 .8	−16 33	5.7	B3	+32 to −54	3	Possibly comp. spectrum
χ *Serpentis*	15 37 .6	+13 8	5.3	A3p	+36 to − 4	3	
11 *Scorpii*	16 2 .6	−12 30	5.8	B9	− 6 to −50	4	
Piazzi 303	17 3 .6	− 0 58	6.2	A	− 8 to −39	4	
70 *Herculis*	17 17 .2	+24 35	5.5	A	− 3 to −25	3	
108 *Herculis*	18 17 .5	+29 49	5.7	A3	+38 to −94	4	
Piazzi 318	19 3 .0	+28 29	5.7	A3	− 6 to −42	3	
2 *Sagittæ*	19 20 .3	+16 46	6.2	A3	+61 to +18	2	
ψ *Aquilæ*	19 40 .4	+13 5	6.4	Ap	+16 to −27	3	
2984 *Groom.*	19 54 .1	+40 8	5.6	B3	+23 to −65	2	
20 *Vulpeculæ*	20 8 .2	+26 13	6.0	B8p	−15 to −37	4	Hβ doubly reversed
36 *Cygni*	20 15 .1	+36 43	5.8	A	+ 2 to −30	3	
ι *Delphini*	20 33 .5	+11 4	5.5	A2	+45 to +18	3	
3258 *Groom.*	20 38 .7	+41 24	5.8	B9	−16 to −40	3	
76 *Cygni*	21 38 .0	+40 18	6.2	B9	+33 to − 7	2	
45 *Capricorni*	20 39 .1	−15 10	6.2	A2	+44 to − 3	3	
25 *Pegasi*	22 3 .6	+21 16	5.9	B5p	−36 to −59	3	Hβ bright
8 *Lacertæ*	22 31 .9	+39 10	5.9	Oep	+ 7 to −32	3	Hβ unsymetrically reversed
12 *Lacertæ*	22 37 .5	+39 45	5.4	B2	+ 9 to −43	4	
30 *Cephei*	22 38 .5	+63 7	5.3	B9	+40 to − 5	3	
18 *Andromed.*	23 34 .8	+49 58	5.4	B8	+37 to − 1	4	Spectrum probably composite
Bradley 3184	23 51 .0	+56 55	6.2	Oep	−10 to −133	3	

WALTER S. ADAMS.

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[1] Spectra are B5 and probably A3. Measures on stronger spectrum B5.